The Science of Diversity and the Impact of Implicit Bias

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NIH National Institutes of Health
Office of the Director

Scientific Workforce Diversity

Use of This Module

- This presentation presents information about scientific workforce diversity and factors that contribute to limiting diversity, including implicit bias

- Viewing this presentation is not a substitute for broader efforts to reduce implicit bias and its negative outcomes on scientific career advancement

- Please contact us with questions: SWDToolkit@od.nih.gov

Presentation Outline

- Why diversity?
  - Diverse is a driving force for excellence and innovation
  - Defining diversity
  - Lack of diversity in science: the evidence

- Hurdles to diversity: Implicit bias
  - Pervasiveness of implicit bias
  - Evidence
  - Strategies for overcoming bias
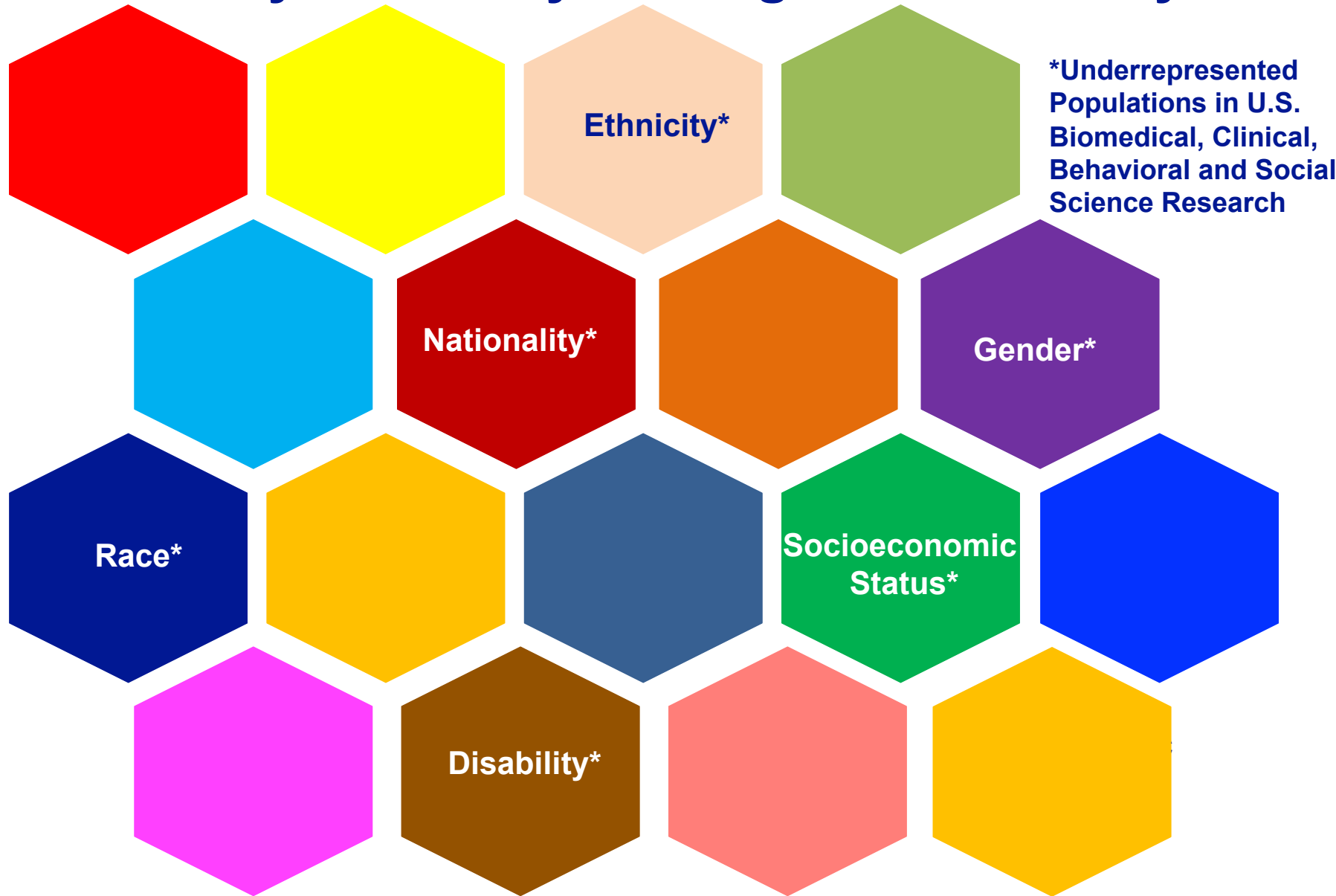
Why Diversity Matters
Capitalizing on the Opportunity

- Excellence, creativity, innovation
- Broadening scope of inquiry - solutions to complex problems of health and disease
- Impact of workforce diversity on health disparities
- Ensuring fairness
  - Changing demographics
  - Leveraging the entire U.S. intellectual capital

Capturing the Benefits of Diversity
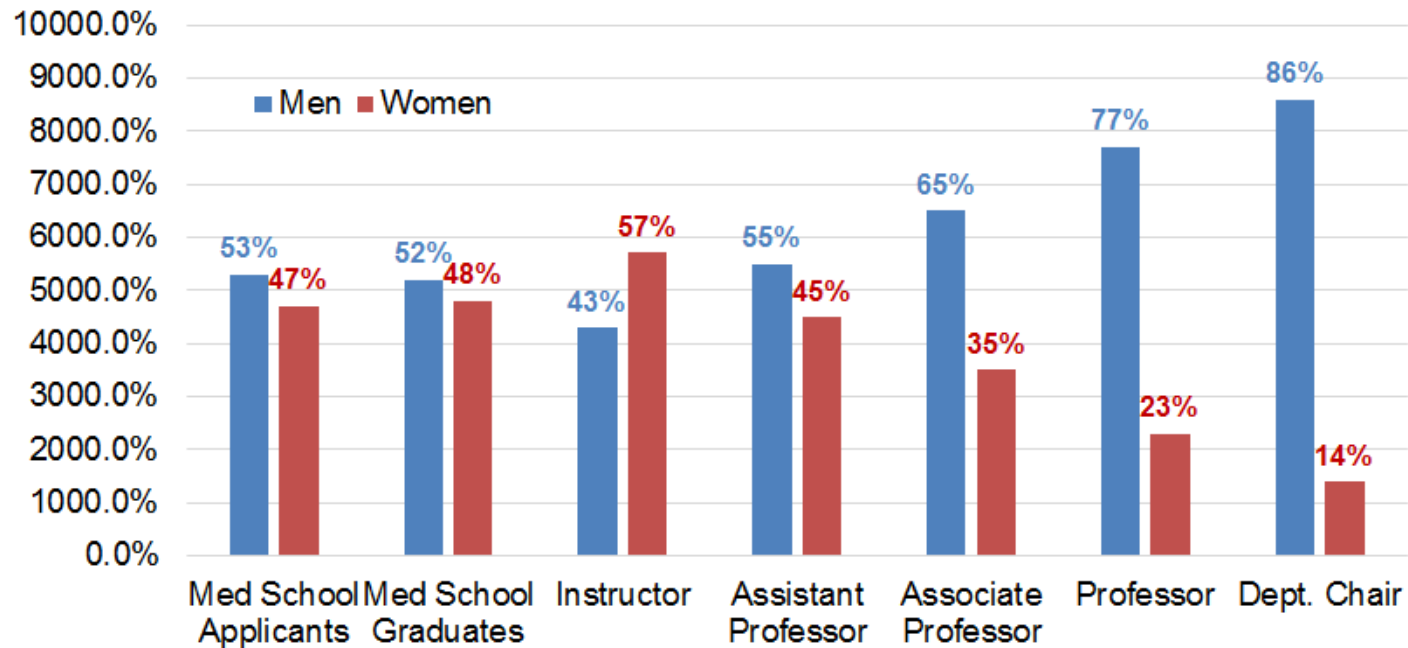## Identity is a Proxy for Cognitive Diversity

Ethnicity*

Nationality*

Gender*

Race*

Socioeconomic Status*

Disability*

*Underrepresented Populations in U.S. Biomedical, Clinical, Behavioral and Social Science Research

Capturing the Benefits of Diversity
Identity is a Proxy for Cognitive Diversity

Thinking Style

Language

Ethnicity*

Religion

*Underrepresented Populations in U.S. Biomedical, Clinical, Behavioral and Social Science Research

Perspectives

Experiences

Nationality*

Geography

Race*

Culture

Skills

Gender*

Physical Abilities

Sexual Orientation

Disability*

Age

Socioeconomic Status*

U.S. Women Faculty in Science - 2016

Clinical and Basic Science Departments Combined

U.S. Women Faculty in Science - 2016

Clinical and Basic Science Departments Combined

Gender gap in academic medicine (2016)

At the current rate of improvement, attaining gender parity will take a very long time (48 years nationwide)

http://www.aamcdiversityfactsandfigures2016.org/report-section/section-5/medical-schools/#tablepress-31 (Med School, 2015)

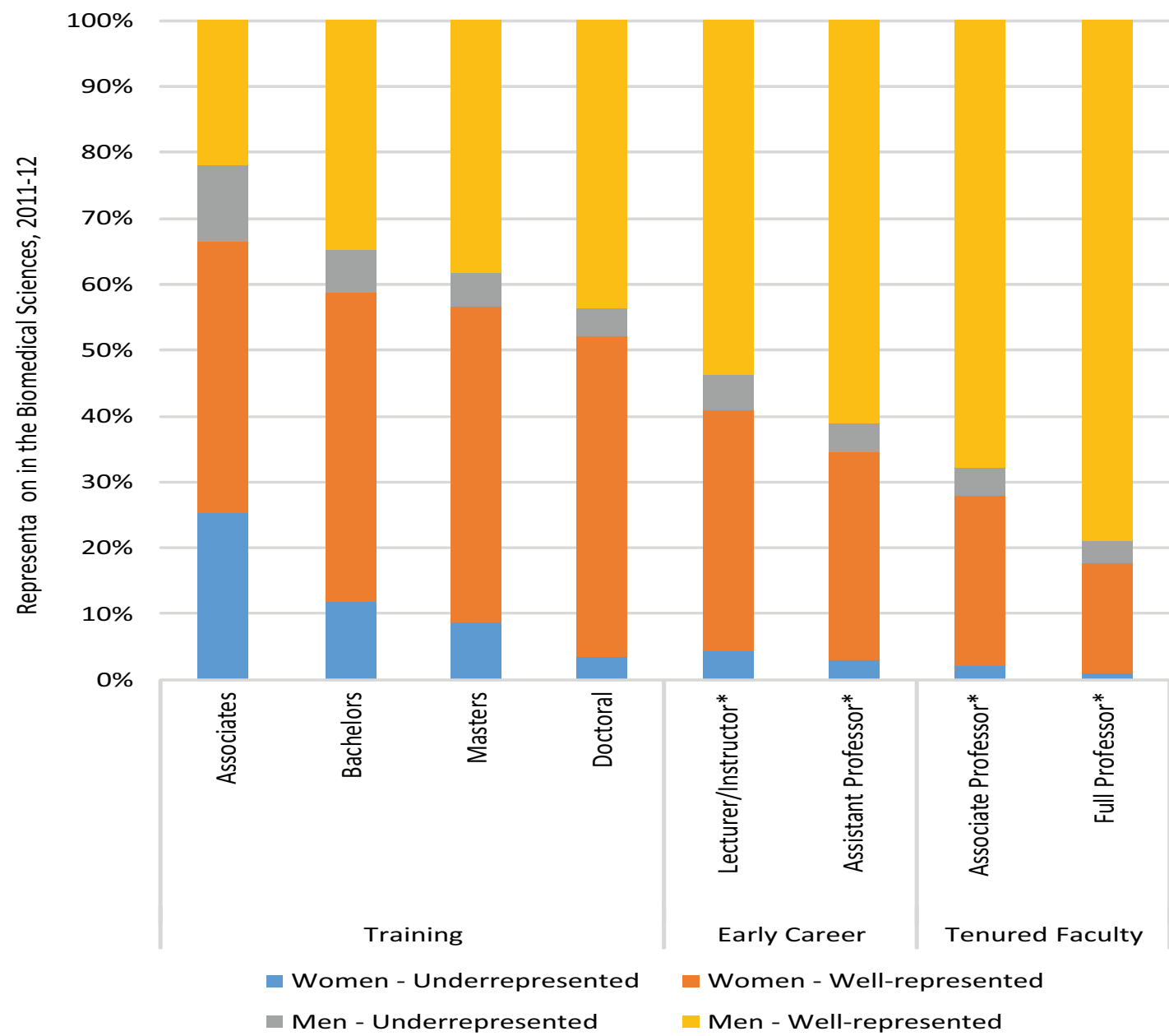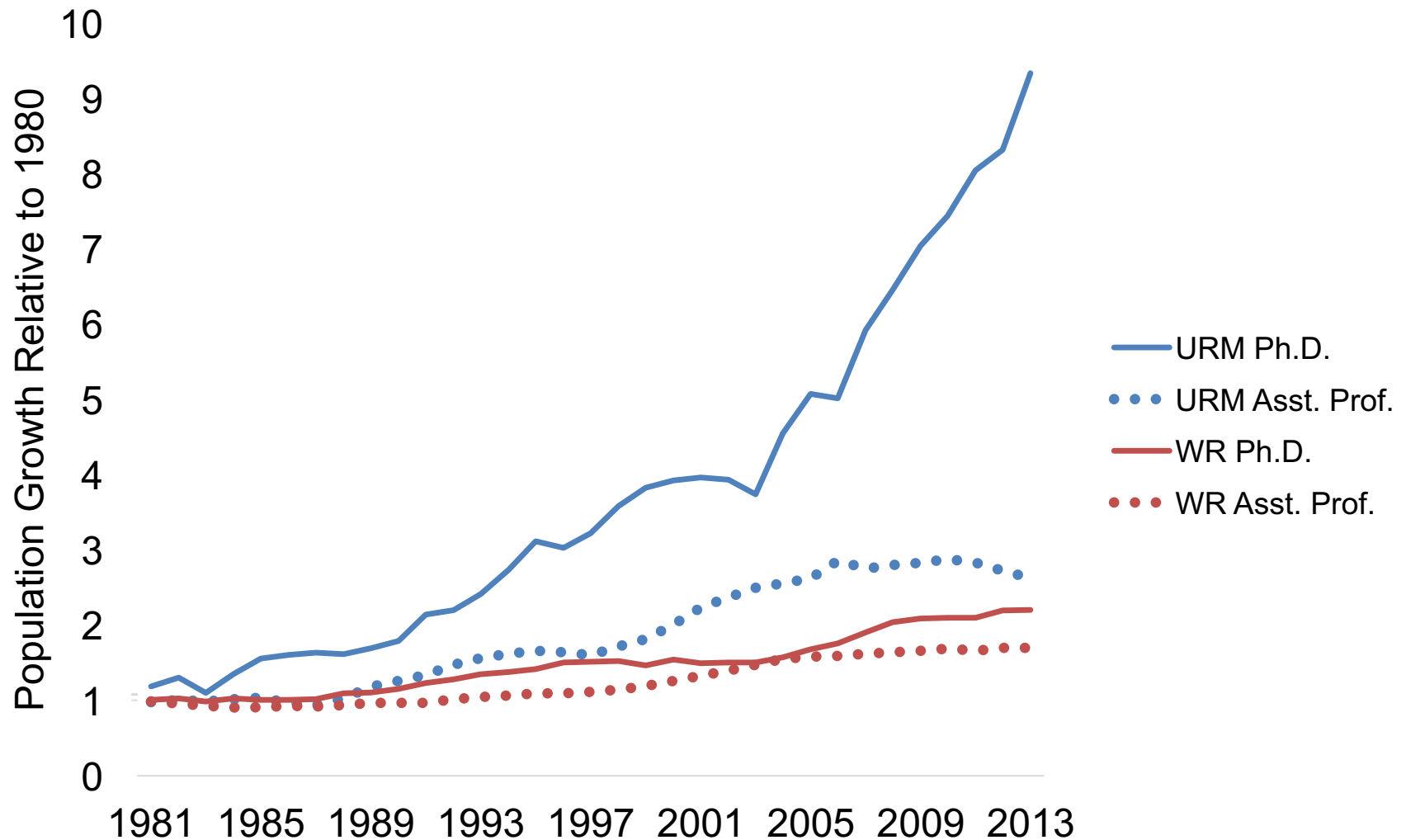# Lack of Diversity in Biomedical Science Careers

Population Growth: URM Ph.D. Recipients and Assistant Professors

Gibbs, K. D., et al. (2016). *Decoupling the minority PhD talent pool and assistant professor hiring in the medical school basic science departments in the US*.

URM Pool for Transition into the Biomedical Research Workforce

Average Number of URM Doctorate Recipients 2000-2012
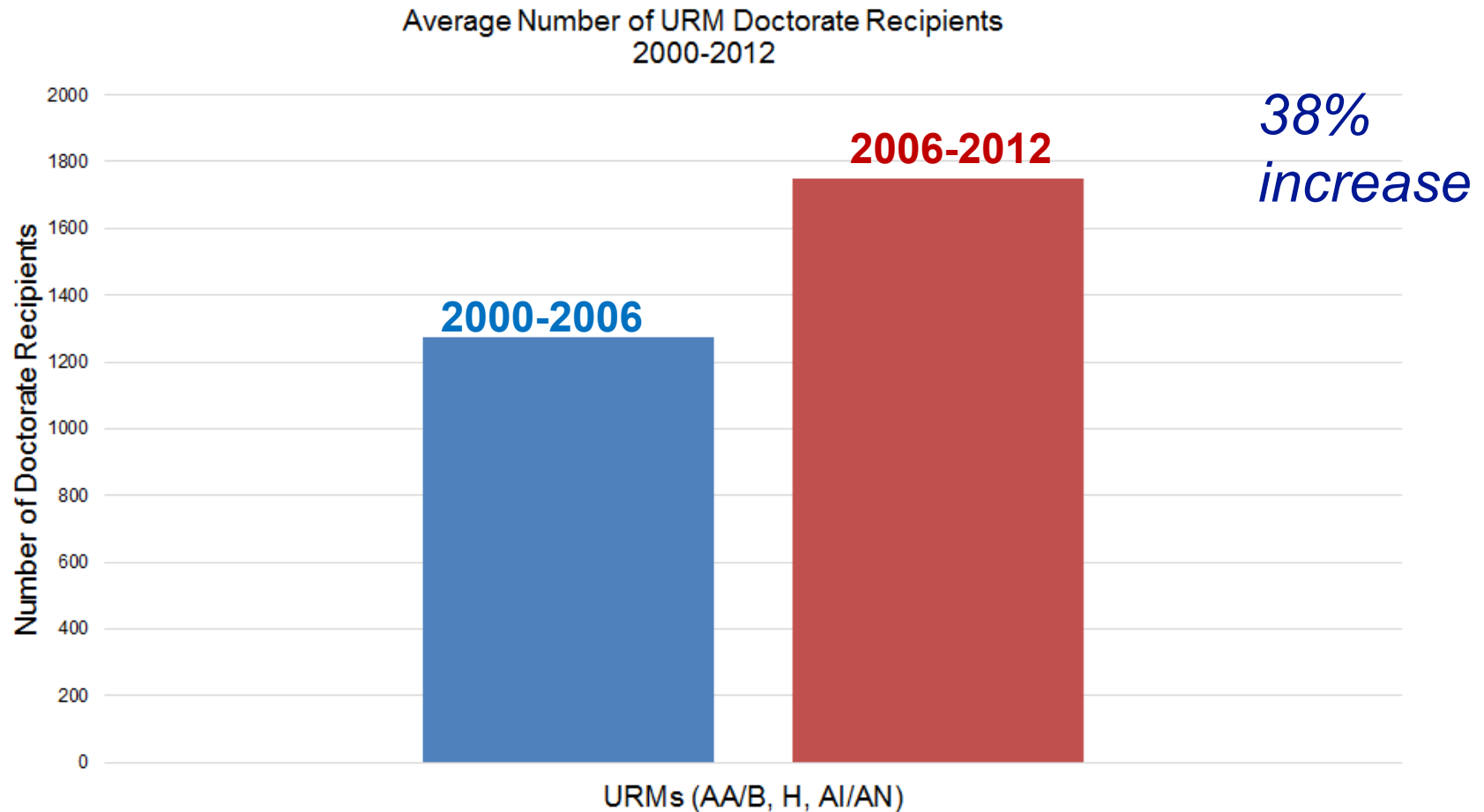
URM Pool for Transition into the Biomedical Research Workforce

- ~10% of all PhD earners, 2006-2012:

- ~780 AA/B (~4% of entire pool)

- ~950 Hispanic (~5.7% of entire pool)

- 30 AI/AN (0.2% of entire pool)

DIVERSITY IN SCIENCE

Without inclusion, diversity initiatives may not be enough

Focus on minority experiences in STEM, not just numbers

But numbers matter …

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POLICY FORUM

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But numbers matter ...

Diversity of Thought: Driving Force for Innovation

- Cognitive diversity (diversity of thought) increases:
  - Creativity
  - Search for novel information
  - Search for novel perspectives
  - Better decision making

- Gender/ethnic identity as proxy for cognitive diversity

Better Problem-solving Results From a Larger Informational, or Cognitive Space
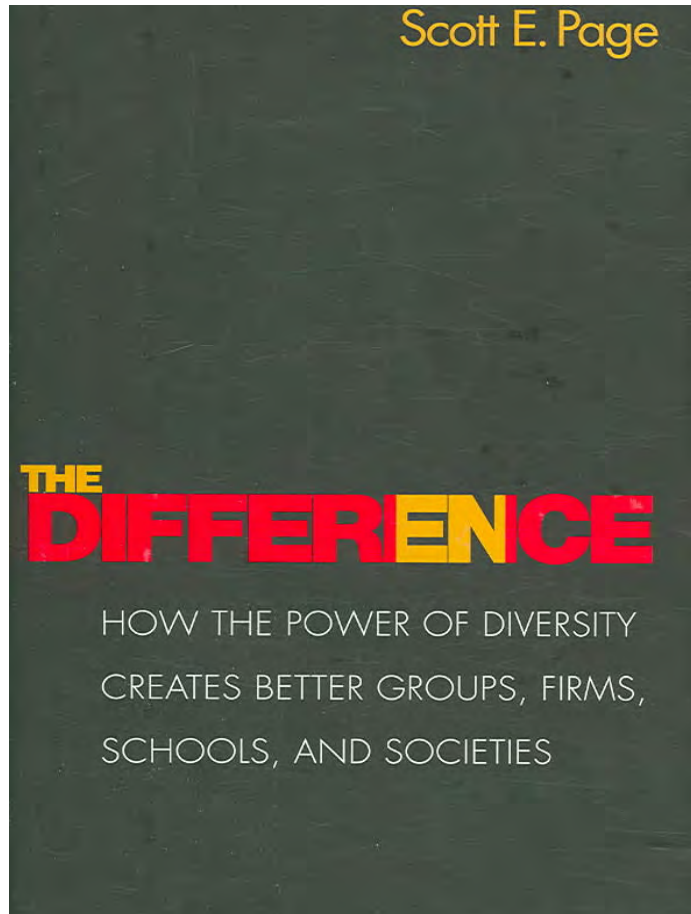
Scott E. Page

THE DIFFERENCE

HOW THE POWER OF DIVERSITY CREATES BETTER GROUPS, FIRMS, SCHOOLS, AND SOCIETIES

- <u>Argument</u>: diversity outperforms ability

- <u>Test</u>: hypothetical scenarios reflecting problem solving abilities

- <u>Result</u>: randomly selected participants from applicant pool were better at solving the problem than the highest-scoring individuals

Groups of diverse problem solvers can outperform groups of high-ability problem solvers. *PNAS* 2004 Nov 16;101(46):16385-9.

# Better Problem-solving Results From a Larger Informational, or Cognitive Space

Scott E. Page

THE **DIFFERENCE**

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- Diversity enhances:
  – Jury Decision Making*
  – Accurate stock trading predictions**
  – Publications in higher impact journals

Sommers, S. R. (2006); ** Levine, S. S. (2014 PNAS)

Diversity and Financial Decision Making

Ethnically homogenous financial traders   vs.   Ethnically heterogeneous financial traders

Stock-trading simulations
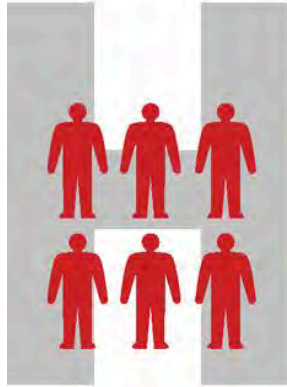Random assignment

Experimental Study

Less able to accurately predict stock prices (33% decline)

More likely to accept inflated prices (that contribute to financial bubble) and when bubbles burst, they crashed more severely

Levine, S. S., Apfelbaum, E. P., Bernard, M., Bartelt, V. L., Zajac, E. J., & Stark, D. (2014). Ethnic diversity deflates price bubbles. _Proceedings of the National Academy of Sciences, 111_(52), 18524-18529.

Diversity and Financial Decision Making

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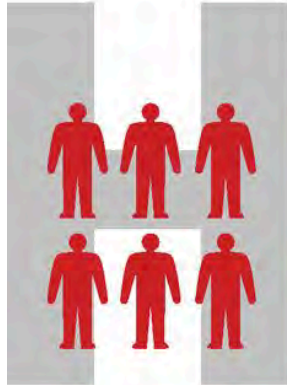
Stock-trading simulations
Random assignment

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"Diversity facilitates friction that enhances deliberation and upends conformity."

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Diversity and Jury Decision Making
Black Defendant

Experimental study – randomly assigned

Racially homogenous jurors   vs.   Racially heterogeneous jurors

Diversity and Jury Decision Making
Black Defendant

Experimental study – randomly assigned

Racially homogenous jurors   vs.   Racially heterogeneous jurors

Measure	All-White Group	Diverse Group*
Deliberation length, in minutes	38.49	50.67
# of case facts discussed	25.93	30.48
# of factual inaccuracies	7.28	4.14
# of uncorrected inaccurate statements	2.49	1.36

Wider range of information exchange; in diverse group – whites cited more facts; more discussion; fewer errors

Sommers, S. R. (2006). On racial diversity and group decision making: identifying multiple effects of racial composition on jury deliberations. *Journal of personality and social psychology*, *90*(4), 597.

Diversity and Quality of Science

- 2.57 million scientific papers between 1985-2008 (authors with U.S. addresses); 11 scientific fields
- Surnames of co-authors – ethnic diversity
- Controlled for # authors; population density etc.
- Lots of homophilly: association with similar others

> Papers written by a diverse groups:
> - Receive more citations
> - Published in journals with higher impact factors

- Similar finding for gender diversity*

Freeman, R. B., & Huang, W. (2014).*National Bureau of Economic Research*, No. w19905.

* Campbell LG, et al. (2013) Gender-heterogeneous working groups produce higher quality science. *PLoS One*.

Why the Diversity Effect?

- Simply being exposed to diversity can change the way we think:

  - Anticipate differences

  - Encourage consideration of alternatives

  - Dissent provokes more thought when it comes from someone who is different from us

  - Opinion dissent in diverse groups contributes to novelty and integrative complexity

- Diversity can be a catalyst for change, growth, and innovation
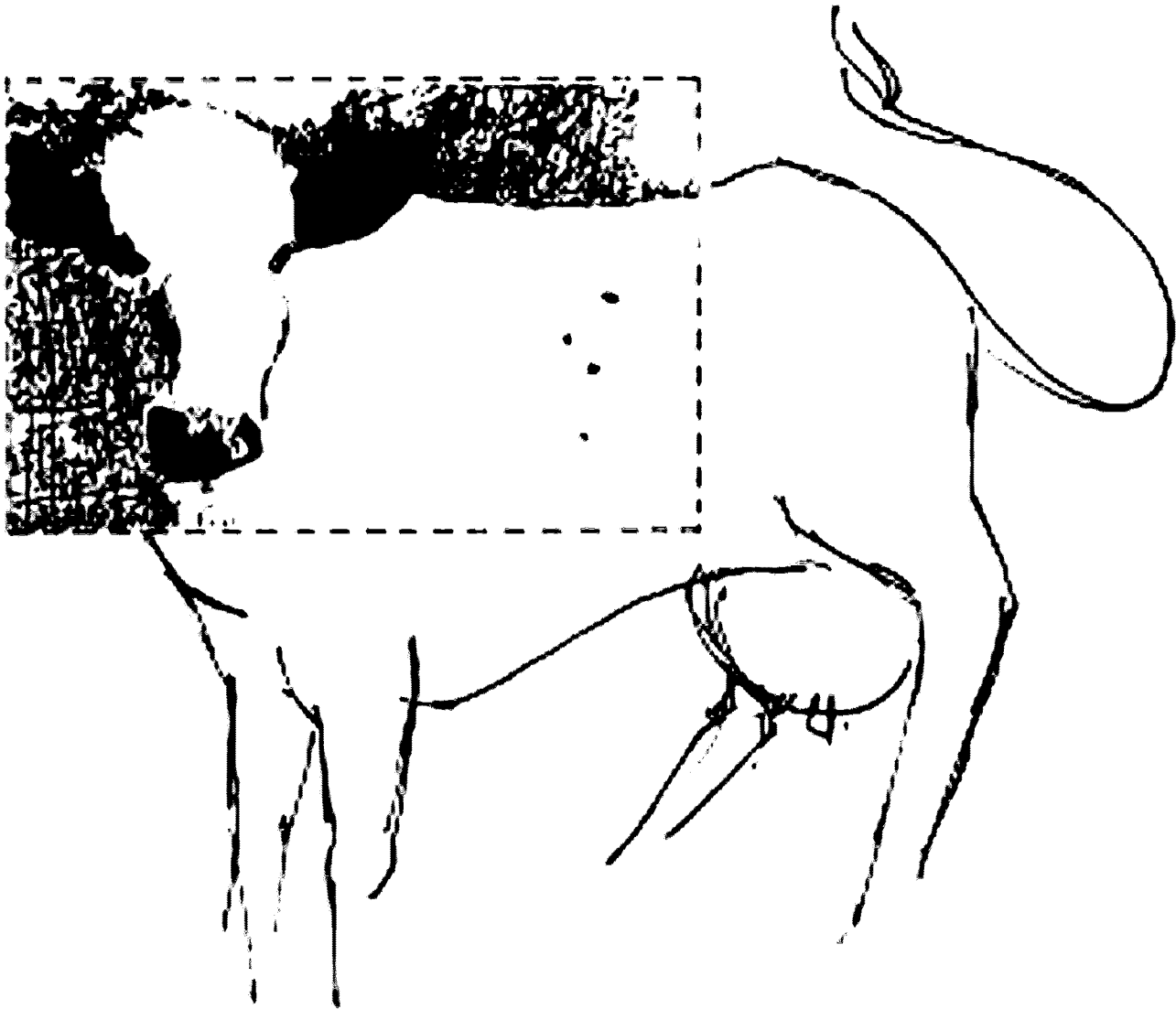
Hurdles to Diversity

- Easy answers have not been sufficient:
  - Not lack of talent
  - Not lack of commitment or interest
  - Pipeline is usually not a/the problem

- Feelings of isolation, lack a sense of belonging
- "A threat in the air"

Wilson, T. (2002). *Strangers to Ourselves: Discovering the Adaptive Unconscious.*
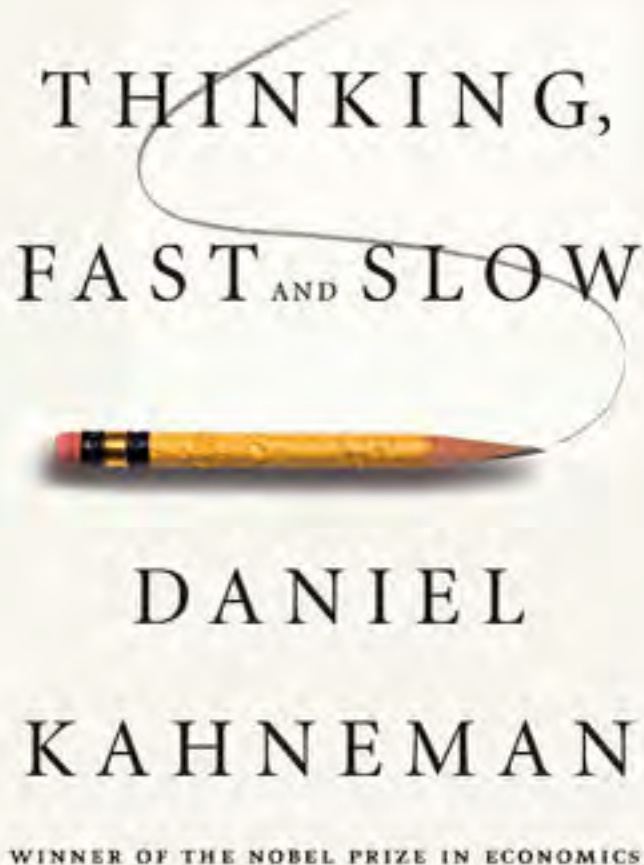
Nature of Implicit Bias

- Nobel-prizing winning neuroscientist Eric Kandel estimates that 80-90% of our mind works without conscious awareness

  - Exposed to 11 million pieces of sensory information
    - Can handle only 40

  - We must use mental shortcuts and past knowledge to make assumptions, aka "mind habits"

  - These habits influence our thoughts, judgment, and interpretations

  "We see what we look for, and look for what we know"

Dallenback, K.M. (1951) *A puzzle-picture with a new principle of concealment. American Journal of Psychology, 54,* 431-433

# Psychology of Judgment and Decision-Making, Behavioral Economics

Daniel Kahneman - Nobel Prize-winning psychologist concluded in a classic 1974 work that "mental shortcuts," or heuristics, leads to errors often caused by:

- Overweighing evidence
- Ignoring baselines
- Only recalling certain aspects of information to inform a judgment

THINKING, FAST AND SLOW

DANIEL KAHNEMAN

WINNER OF THE NOBEL PRIZE IN ECONOMICS

Who is a "Scientist"?

Draw-A-Scientist Test: Percent of Students Who
Drew A Male Scientist
(N=1504)

Barman, CR. (1999). *J. Science Teacher Education, 10*(1), 43-54
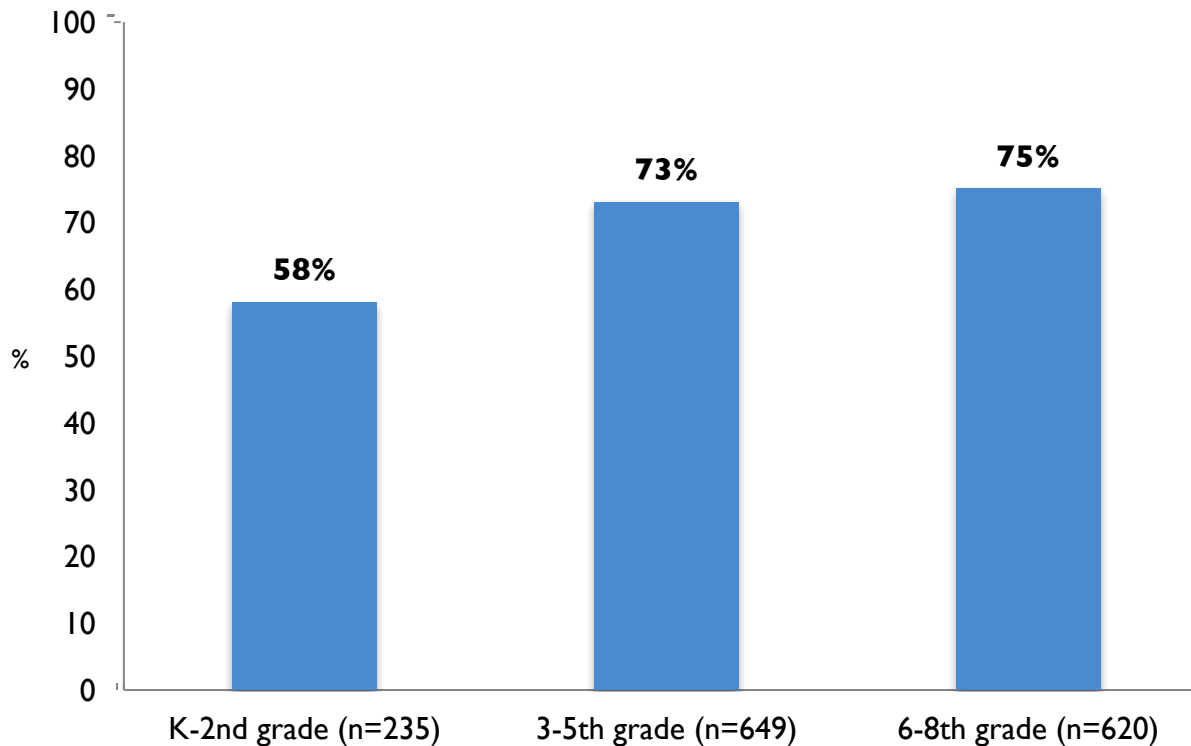
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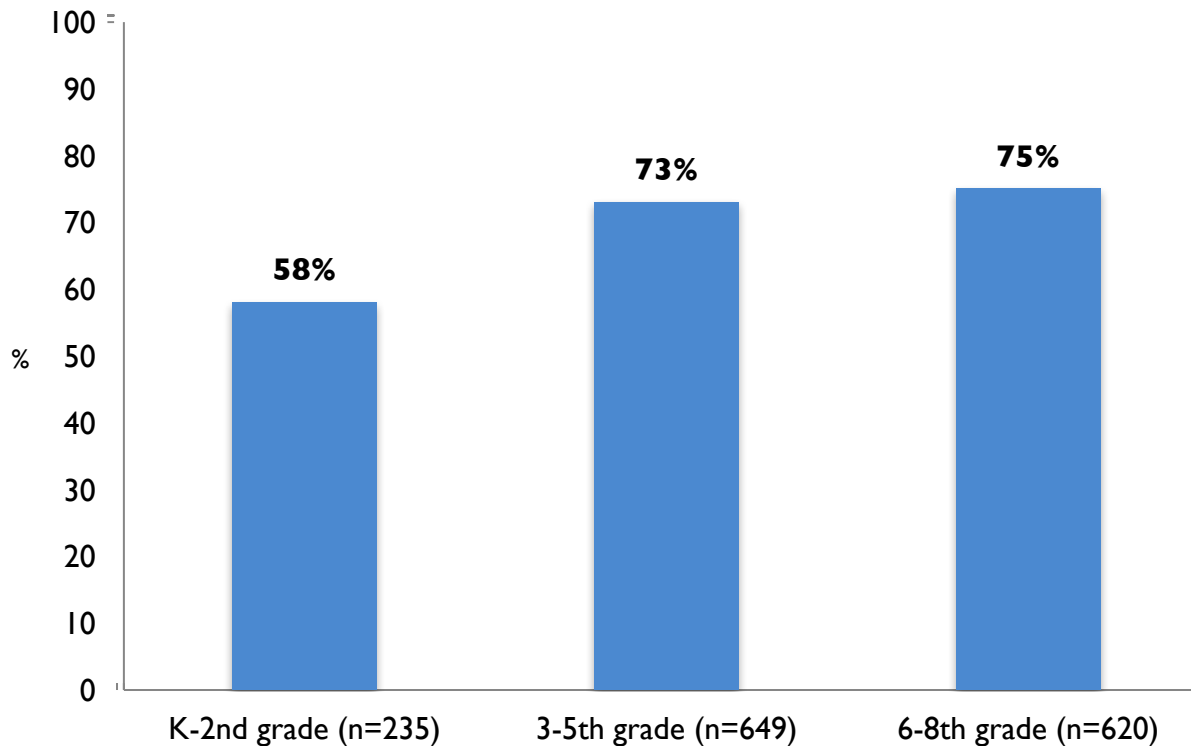
By the age of 6, young girls are less likely than boys to view their *own gender* as "brilliant"

Bias Begins Early: "Girls Aren't Brilliant"

Barman, CR. (1999). *J. Science Teacher Education, 10*(1), 43-54
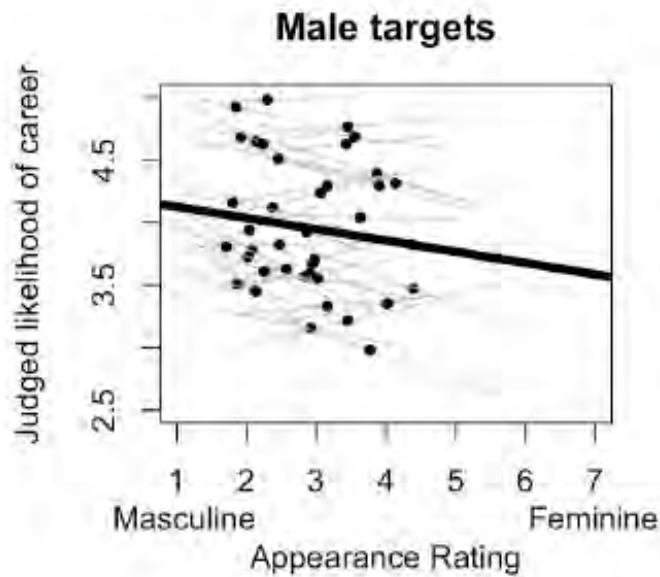
Who is a Scientist?

Do subtle variations in feminine appearance erroneously convey a woman's likelihood of being a scientist?

- Pictures of actual faculty members in STEM at elite universities
- Rated for masculinity and femininity
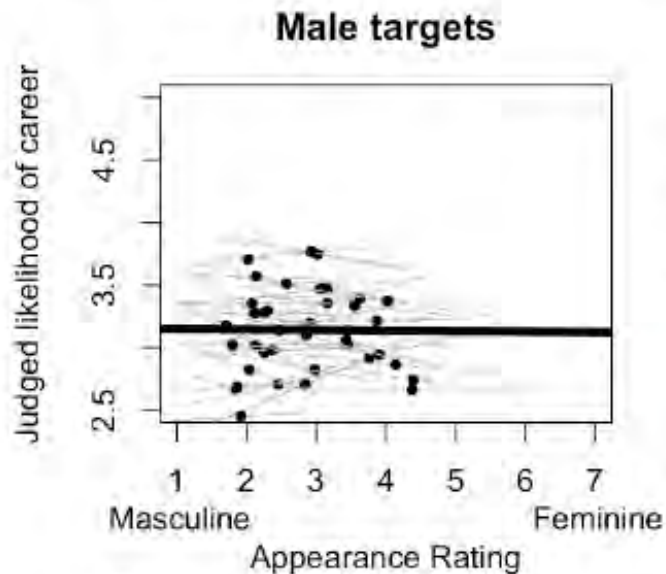- Separate group of students rated pictures for likelihood of being

Banchefsky, S., Westfall, J., Park, B., & Judd, C. M. (2016). But You Don't Look Like A Scientist!: Women Scientists with Feminine Appearance are Deemed Less Likely to be Scientists. *Sex Roles*, 1-15.
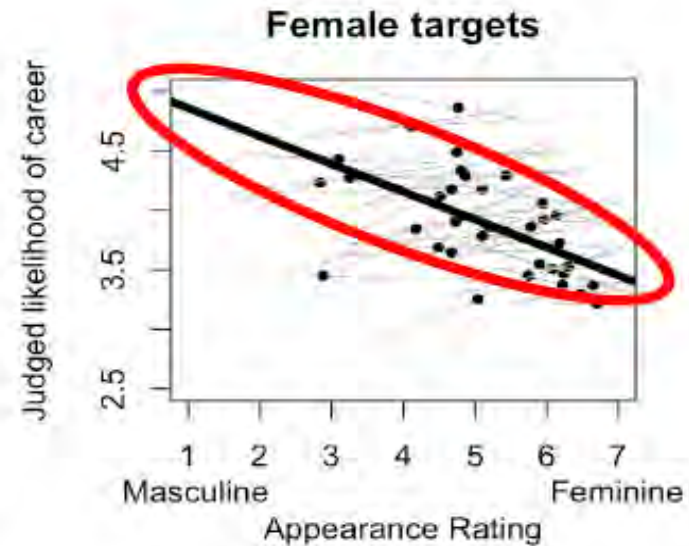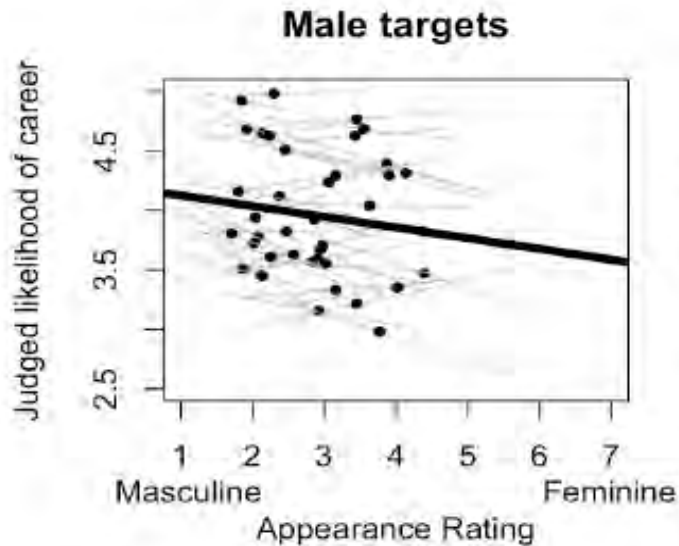
Male targets

a) Career Likelihood as a Scientist

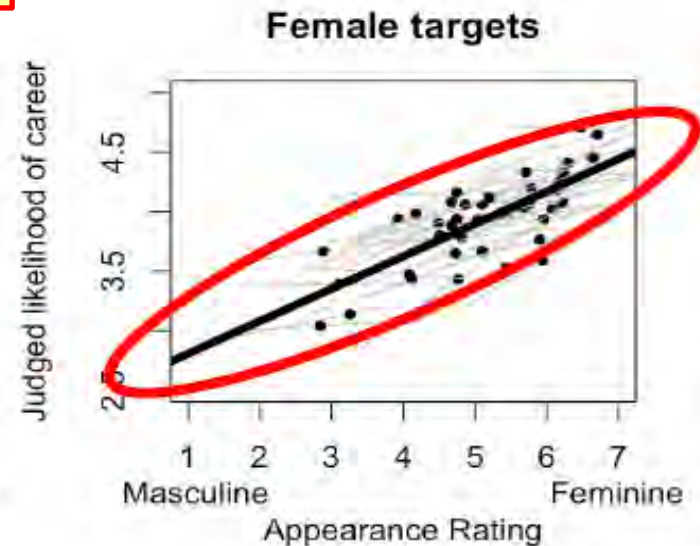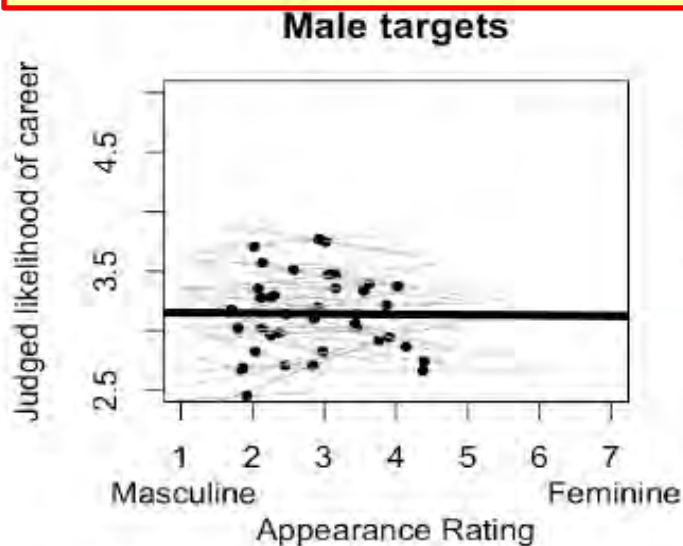For males, appearance made no difference

Male targets

b) Career Likelihood as a Teacher

Feminine women are deemed less likely to "be a scientist"

a) Career Likelihood as a Scientist

b) Career Likelihood as a Teacher

Implicit Bias: Auditions and Hiring

When gender is removed from the view, decisions we make may change

Quantitative analysis of audition and hiring records from major U.S. symphony orchestra from 1970-1996

- Data -14,000 individuals - using a screen to blind auditions increases the chance that a woman will advance from preliminary rounds by 50%

- Roster data from 11 major orchestras shows the switch to blind auditions accounted for 30% increase in new hires of women musicians.

Anne-Sophie Mutter

Goldin, C, & Rouse, C. (2000). *American Economic Review, 90*(4), 715-741

Evaluations in Academic Science

A nationwide sample of biology, chemistry, and physics professors (n=127) evaluated application materials of an undergraduate science student (female or male) for a lab manager position.
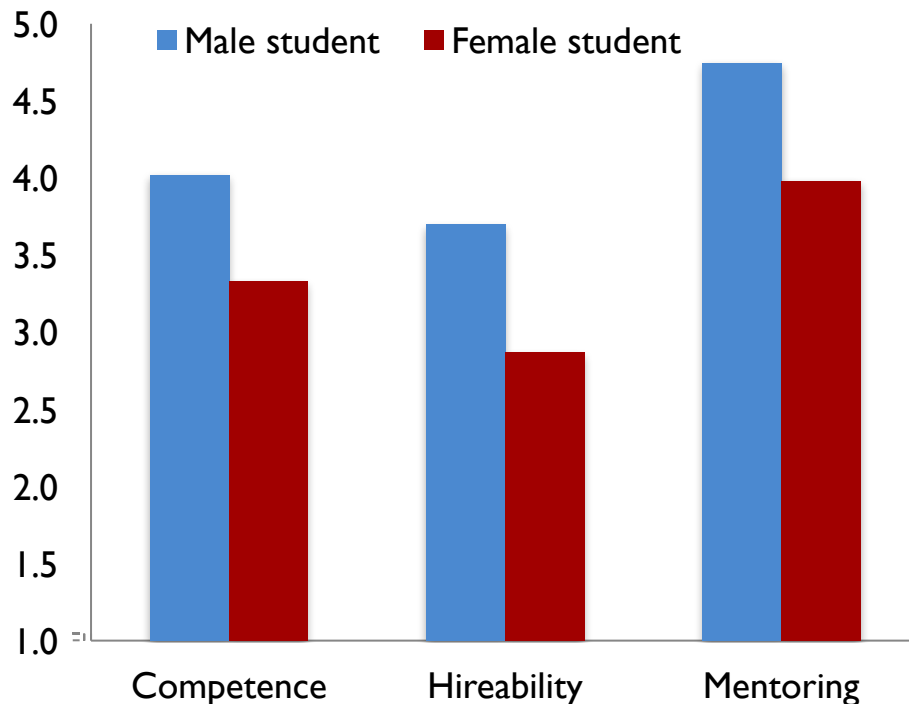
1. **Both** male and female faculty participants rated the female student as:

- Less competent
- Less hireable
- Offered lower salary ($3.7K)
- Less mentoring

2. Even though the female was rated more likeable

Moss-Racusin CA, Dovidio JF, Brescoll VL, Graham MJ, Handelsman J. (2012) PNAS

Letters of Recommendation for Medical School Faculty

Analysis of 312 recommendation letters for 103 positions at a medical school revealed different tendencies…

Letters for men:
Longer;
More references to CV,
Publications, Patients,
Colleagues

Letters for women:
Shorter;
More "doubt raisers" (hedges,
faint praise, and irrelevancies);
More references to personal life

"It's amazing how much she's accomplished."

Trix, F, & Psenka, C. (2003). *Discourse & Society, 14*(2), 191-220.

NIH Peer Review of R01 Renewal

- Summary statements for 51 R01 renewals

- Descriptions for males:
  - "leader" and "pioneer"
  - "highly innovative"
  - "highly significant research"

  > Occurred more in critiques of funded applications

- Descriptions for females:
  - "expertise"
  - working in "excellent environments"

  > Occurred similarly in funded and unfunded applications

Magua, W, et al. (2017). Are female applicants disadvantaged in National Institutes of Health peer review? Combining algorithmic text mining and qualitative methods to detect evaluative differences in R01 reviewers critiques. Journal of Women's Health, 26(5).

Seeing Patients: Implicit Bias in Health Care
Augustus A. White III, M.D.

"Subconscious stereotyping influences doctor–patient interactions, diagnosis, and treatment in a diverse twenty-first-century America"

Publication: January 2011

The NEW ENGLAND JOURNAL of MEDICINE

The Effect of Race and Sex on Physicians' Recommendations for Cardiac Catheterization

Kevin A. Schulman, M.D., Jesse A. Berlin, Sc.D., William Harless, Ph.D., Jon F. Kerner, Ph.D., Shyrl Sistrunk, M.D., Bernard J. Gersh, M.B., Ch.B., D.Phil., Ross Dubé, Christopher K. Taleghani, M.D., Jennifer E. Burke, M.A., M.S., Sankey Williams, M.D., John M. Eisenberg, M.D., William Ayers, M.D., and José J. Escarce, M.D., Ph.D.

TABLE 5. PREDICTORS OF REFERRAL FOR CARDIAC CATHETERIZATION.*

MODEL AND VARIABLE	ODDS RATIO (95% CI)†	P VALUE
Race and sex as separate factors		
Sex		
Male	1.0	
Female	0.6 (0.4–0.9)	0.02
Race		
White	1.0	
Black	0.6 (0.4–0.9)	0.02
Interaction of race and sex		
White male	1.0	
Black male	1.0 (0.5–2.1)	0.99
White female	1.0 (0.5–2.1)	>0.99
Black female	0.4 (0.2–0.7)	0.004

*Both models included all experimental factors as covariates, as well as the probability of coronary artery disease as estimated after the results of the stress tests were known. The first analysis included only the main effects. The second analysis explored a race–sex interaction.

†CI denotes confidence interval.

- Race and sex were significant predictors of rates of referral for cardiac catheterization

- Men and whites were significantly more likely to be referred than women and blacks

Racial and Ethnic Disparities in Diabetes Screening Between Asian Americans and Other Adults: BRFSS 2012–2014

- Asian Americans are known to be at higher risk for type II diabetes than other groups

- Adults: 526,000 eligible for diabetes screening by ADA guidelines

Results:

- Asian Americans had 34% lower adjusted odds of receiving recommended diabetes screening compared to non-Hispanic whites

- Least likely racial and ethnic group to receive recommended diabetes screening

Tung, E.L., Baig, A.A., Huang, E.S. et al. J GEN INTERN MED (2016).

Workforce Diversity and Health Disparities

Patients' Beliefs About Racism, Preferences for Physician Race, and Satisfaction With Care
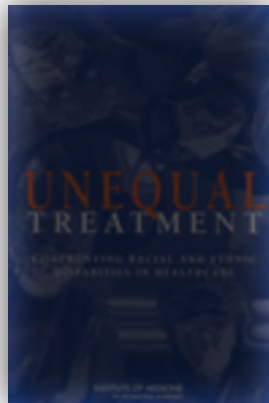
ANNALS OF FAMILY MEDICINE

Frederick M. Chen, MD, MPH[1]
George E. Fryer, Jr, PhD[2]
Robert L. Phillips, Jr, MD, MSPH[2]
Elisabeth Wilson, MD, MPH[3]
Donald E. Pathman, MD, MPH[4]

Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care

POLICY FORUM

Diversity in Clinical and Biomedical Research: A Promise Yet to Be Fulfilled

Sam S. Oh[1], Joshua Galanter[1,2], Neeta Thakur[1], Maria Pino-Yanes[1,3,4], Nicolas E. Barcelo[1], Marquitta J. White[1], Danielle M. de Bruin[1], Ruth M. Greenblatt[1,5], Kirsten Bibbins-Domingo[1,6], Alan H. B. Wu[7], Luisa N. Borrell[8], Chris Gunter[9,10], Neil R. Powe[1,6☉], Esteban G. Burchard[1,2☉]*

- Most physicians and scientists are informed by research extrapolated from a largely homogenous population, usually white and male.
- Minority physicians and scientists are more likely to conduct research in minority populations and are often best suited to gain the trust of minority communities
- Increasing the number of health providers from underrepresented groups has the potential to broaden the nation's health disparities research agenda

Strategies to Mitigate the Influence of Implicit Bias

WHAT CAN WE DO?

How can we control what we are not consciously aware of?

Common Implicit Bias

False Correlation – seeing a relationship between things when the relationship actually doesn't exist *(e.g. illusory correlation)*

Confirmation Bias – Overweighing of evidence consistent with a favor belief

(e.g. You really like a candidate for some reason, so you look for information that makes that person a great scientist)

"Similar to me" Bias – People like me are more positive than others. Preferring people who are like us or similar to us *(in-group bias)*

Overcoming Confirmational Bias

- Don't jump to conclusions – take it all in
  - Gather balanced evidence
  - Articulate your decision (whether it is to move forward or drop with a candidate)

- The rule of 3 - Gather balanced evidence
  - Try to come up with 3 alternative explanations

Overcoming Similar to Me/Ingroup Bias

- Recognize the arbitrary nature of in/outgroup distinctions.

- Get to know the outgroup member – likely they may be like you!

- Look for commonalities! Unique information about the candidate (Individualize)

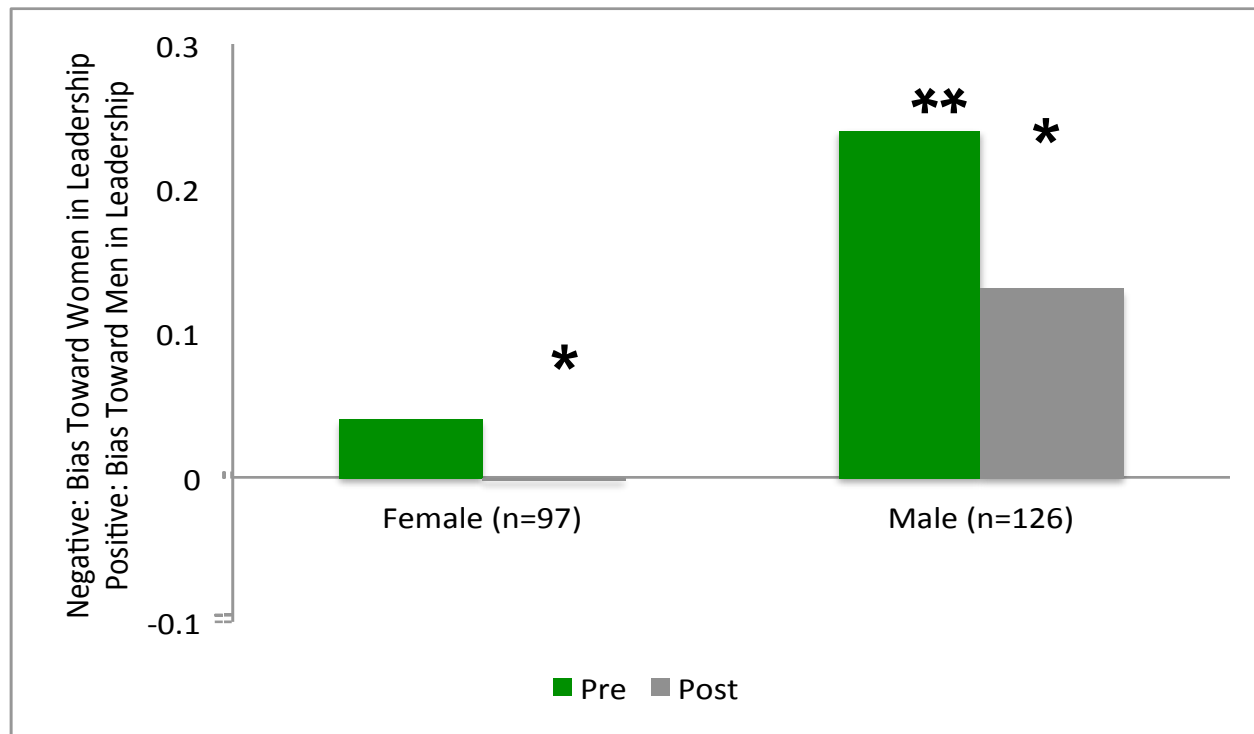- Diversity → creativity and innovation!

Habit Breaking: Educational Intervention Works!

- 92 departments, matched by school/college

- Randomized controlled intervention

- Intervention group reported:

  - Greater personal bias awareness
  - More motivation to promote gender equity
  - More confidence in being able to enact gender equity
  - Feel that it would be personally beneficial to promote gender equity in one's department

- Persisted 3 months

Carnes, M., Devine, P. G., Manwell, L. B., Byars-Winston, A., Fine, E., Ford, C. E., ... & Palta, M. (2015). The effect of an intervention to break the gender bias habit for faculty at one institution: a cluster randomized, controlled trial. *Academic Medicine*, *90*(2), 221-230.

Pre and Post Scores on the Implicit Association Test (IAT)

Significant effect of gender: **p=0.001; significant effect of the intervention: p=0.02

Use a Habit-Breaking Routine

Plan out in advance when, where, and how to act on your goal in an **if-then** format:

"***If*** I encounter a member of _____ group, ***then*** I will think _____ ."

- Interrupts routine behavior
- Uses situational cues
- Serves as a subtle reminder

- "If I am the most senior person in the room, then I will share my ideas last."

Stewart, B. D., & Payne, B. K. (2008). Bringing automatic stereotyping under control: Implementation intentions as efficient means of thought control. *Personality and Social Psychology Bulletin, 34*(10), 1332-1345.

Imagine Counter-Stereotypical Individuals

Think of individuals who do not fit stereotypes

- Reduces stereotypes:
    - *Participants were asked think of strong powerful women for 5 mins, gender stereotypes became weaker*
- Increases creativity and cognitive flexibility

Sylvester James Gates (physicist famous for super string theory)

Mae Jemison (astronaut, first black woman in space)

Jane Goodall (primatologist, famous for her work on chimp social interactions)

Neil deGrasse Tyson (astrophysicist, director of the Hayden Planetarium)

Blair, I. V., Ma, J. E., & Lenton, A. P. (2001).. *Journal of personality and social psychology, 81*(5), 828.
Gocłowska, M. A., & Crisp, R. J. (2013). *Thinking skills and creativity, 8*, 72-79.

Walk a Mile in Their Shoes

Try to walk a mile in someone's shoes – adopt his/her perspective and imagine what it's like to be a member of a stigmatized group

Imagine:
- What would it be like to get a job callback for every 15 jobs … when your friend gets a callback for every 10 jobs?

- Have your abilities been called into question?

Galinsky, A. D., & Moskowitz, G. B. (2000). Perspective-taking: decreasing stereotype expression, stereotype accessibility, and in-group favoritism. *Journal of personality and social psychology*, 78(4), 708.

Creating Opportunity and Accountability for Optimal Decision Making in Review Process

- Clarify **what** criteria are most important and **how** to evaluate levels of performance *before* evaluation
  - What is it that you are looking for?
  - What does "excellent" look like?

- Best practices or process "advocate"

- Be consistent and apply the criteria to all candidates

- Allow for anonymous voting (larger groups)

- Be able to articulate every decision

- Encourage playing devil's advocate

Hacking Tech's Diversity Problem

"Bias Interrupters"

- Based on objective metrics, whereas cultural initiatives tend to rely on earnest conversations

- Iterative, so they allow companies to try small interventions and then scale them up

- Build change into the basic business systems - less likely to disappear when a new CEO decides that diversity is not an imperative

Joan Williams, JD. Distinguished Professor of Law, UC Hastings Foundation Chair and Director of the Center for WorkLife Law

Tips for Overcoming Bias in Hiring
1. Check the Job Ad

- Look at the language in the job ads
  - Avoid biased language to encourage more diverse applicant pool

"Dominant" "Competitive" "Leader"

Spokesperson vs. Spokesman

"Up and Coming" "Fresh"

Gaucher, D., Friesen, J., & Kay, A. C. (2011). Evidence that gendered wording in job advertisements exists and sustains gender inequality. *Journal of personality and social psychology*, *101*(1), 109.

Tips for Overcoming Bias in Hiring
2. Recruit Widely – Outside of Network

- Get out of the comfort zone

- Two key factors in implicit bias
  - Familiarity & closeness (within-network)

- SWD recruitment tools
  - Diversity in applicant pool
    - Recruitment search protocol
  - Future Research Leaders Conference
  - Reducing implicit bias – Implicit bias education

- Avoid message: "Only Ivy Leaguers need apply (plus maybe Cal Tech, MIT, and Stanford…)"

Tips for Overcoming Bias in Hiring
3. Standardize the evaluation process

- Bias can lead us to view same resumes differently

- Avoid global judgement

- Develop a standard evaluation form with scoring metrics, and use it for every candidate

Tips for Overcoming Bias in Hiring
4. Identify important characteristics for job

- Biases can lead us to rationalize why we prefer a candidate (over another)
  - Favor publication over potential scientific impact because you like that candidate

- Identify behaviors that are relevant to the position before candidate interviews

- How much does likeability matter in the job?
  - "Fit" ->Tend to hire people we like the most
  - Determined by first 30 seconds – predicts outcome.**
  - If important, give a rating

Dovidio, J. F., & Gaertner, S. L. (2000). Aversive racism and selection decisions: 1989 and 1999. *Psychological science*, 11(4), 315-319.

**Ambady, N., & Rosenthal, R. (1993). Half a minute: Predicting teacher evaluations from thin slices of nonverbal behavior and physical attractiveness. Journal of personality and social psychology, 64(3), 431.*

Tips for Overcoming Bias in Hiring
5. Stick to a script during an interview

- Interaction: We automatically search for a common ground
  - Could make people feel like an outsider and increases stress
  - Women feel more stress when being evaluated by all-male panels

- Stick to the script and ask everyone the same questions

Schmader, T., Johns, M., & Forbes, C. (2008). An integrated process model of stereotype threat effects on performance. Psychological review, 115(2), 336.

Jost, J. T., Pelham, B. W., & Carvallo, M. R. (2002). Non-conscious forms of system justification: Implicit and behavioral preferences for higher status groups. Journal of Experimental Social Psychology, 38(6), 586-602.

Tips for Overcoming Bias in Hiring
## *6. Evaluate your decision metric - again*

- Check of subtle biases within the metric
  - Make sure you are not giving points for
    - Elite institutions
    - Experience at specific institutions
    - Fame of mentor

- Have diverse group of non-search committee member evaluate the metrics

Tips for Overcoming Bias in Hiring
7. Analyze and reassess

- Evaluate your outcome and efforts
  - Disparities will emerge over time (and in aggregate)

- Identify the bottleneck

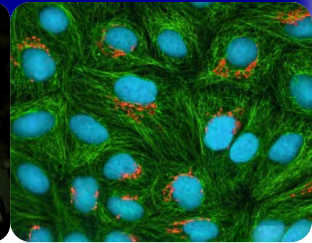 E.g., diversity of applicant pool; shortlist pool; post-interview; hiring process
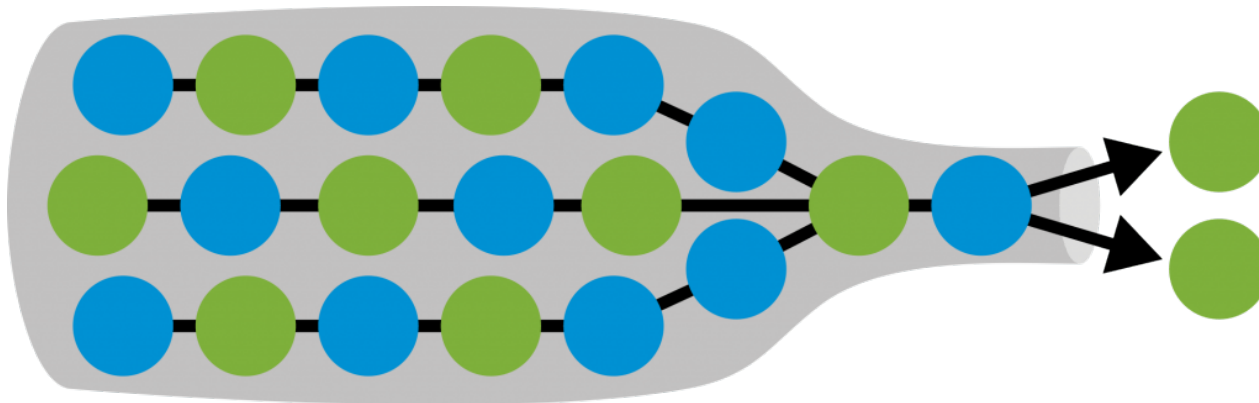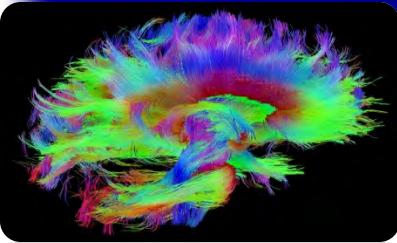
Tips for Overcoming Bias in Hiring

8. Allow for anonymous voting (more applicable for bigger committees)

9. Have a committee member be an advocate for each candidate (or play devil's advocate).

10. Be able to articulate reasons for every decision (move forward vs. drop).

Its all about excellence!